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00:00:10,800 --> 00:00:16,500

Welcome to NASA Television. I'm Ellen Stofan.

Throughout history, women like computer mathematician

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00:00:16,560 --> 00:00:21,939

Katherine Johnson and astronaut Sally Ride

have made unprecedented achievements in space

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00:00:21,939 --> 00:00:25,769

exploration.

They have served as role models for young

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00:00:25,769 --> 00:00:31,989

women and men in the United States and around

the world. They inspired me to pursue a career

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00:00:31,989 --> 00:00:36,940

in science and eventually led me to where

I am today, serving as the Chief Scientist

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00:00:36,940 --> 00:00:41,050

of NASA.

A lot has changed since Katherine Johnson

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00:00:41,050 --> 00:00:46,649

calculated trajectories for some of the Mercury

missions, including John Glenn's first US

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00:00:46,649 --> 00:00:52,019

orbital flight and Sally Rid became the first

American woman in space.

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00:00:52,019 --> 00:00:57,899

Recently, European Space Agency astronaut

Samantha Cristoforetti and Yelena Serova of

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00:00:57,899 --> 00:01:03,839

the Russian Federal Space Agency worked together

on the International Space Station, marking

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00:01:03,839 --> 00:01:09,430
only the second time in the history of the
ISS that two women have served on the same

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00:01:09,430 --> 00:01:13,799
expedition.
My friend Cady is here to introduce us to

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00:01:13,799 --> 00:01:19,270
Samantha and Yelena.
Every day, 16 times a day, our space station

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00:01:19,270 --> 00:01:24,159
orbits the Earth, usually with six people
aboard. Today, we're going to hear from two

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00:01:24,159 --> 00:01:29,329
of them. I actually got to spend six months
aboard the International Space Station. And

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00:01:29,329 --> 00:01:35,250
I really loved every single minute of it.
It was amazing doing experiments that I knew

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00:01:35,250 --> 00:01:41,329
were going to be part of the future, paving
the way to Mars. Now all of us that are astronauts,

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00:01:41,329 --> 00:01:47,619
we come from 16 different countries, many
different technical fields. But, we actually

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00:01:47,619 --> 00:01:52,759
have a few things in common.
I think that almost all of us, when we were

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00:01:52,759 --> 00:01:59,079
trying to figure out what career, what field,
which fork to choose in a road, all of us

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00:01:59,079 --> 00:02:04,149
chose things that we were passionate about,
that we felt really strongly about.

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00:02:04,149 --> 00:02:09,759
And along the way, as we followed those paths,
we made sure that we acquired the tools and

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00:02:09,759 --> 00:02:15,959
the knowledge that we needed to be part of
those fields and also to be members of teams.

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00:02:15,959 --> 00:02:22,959
Today, we're going to hear from Yelena Serova
and Samantha Cristoforetti. They are extraordinary

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00:02:23,349 --> 00:02:28,870
women who, when you read these biographies,
I mean Samantha Cristoforetti is an Air Force

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00:02:28,870 --> 00:02:35,379
pilot and an engineer. And Yelena Serova is
an aeronautical engineer of the highest caliber,

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00:02:35,379 --> 00:02:40,340
also a wife and mother.
When you read those, realize that they're

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00:02:40,340 --> 00:02:45,890
people just like you. They've chosen paths
that they are passionate about. They've done

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00:02:45,890 --> 00:02:51,560
their best. And look where they have ended
up. They have chosen to be prepared for the

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00:02:51,560 --> 00:02:53,879
future.
They've taken a few minutes out of their day

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00:02:53,879 --> 00:02:59,209
today to share their thoughts on what it's
like to live and work up at space. So, let's

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00:02:59,209 --> 00:03:06,209
go hear from Yelena and Samantha aboard the
International Space Station.

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00:03:14,700 --> 00:03:21,080
You know, I like to say that you come to space
with everything that you are, that you have

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00:03:21,080 --> 00:03:24,500
learned in your life, with all the skills
that you have practiced. And some of them

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00:03:24,500 --> 00:03:29,560
are like formal skills that you have learned
in college or during your professional careers.

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00:03:29,560 --> 00:03:34,170
And some of them are just things that you've
learned in your life, just as being a human

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00:03:34,170 --> 00:03:38,110
being.
You know, I'm fortunate that I am with the

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00:03:38,110 --> 00:03:45,110
crew where everybody's incredibly warm-hearted,
kind, patient. And those are incredible assets

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00:03:46,170 --> 00:03:51,049
when you live up here, six people, and you
have a lot of important work to do. And you

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00:03:51,049 --> 00:03:55,099
have to function very well as a team.
Those are things that you bring with you.

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00:03:55,099 --> 00:03:59,049

And they're incredibly important. And then, of course, there's more formal skills, like

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00:03:59,049 --> 00:04:04,189

your understanding of technical systems helps a lot. So, any kind of technical background

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00:04:04,189 --> 00:04:08,379

you have, any kind of scientific background helps a lot because we do a lot of science

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00:04:08,379 --> 00:04:12,569

and research here on board.

Any operational background you have, we're

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00:04:12,569 --> 00:04:17,010

in an operational environment. You know, we're performing a mission. We are working closely

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00:04:17,010 --> 00:04:22,720

with Ground Controllers all over the world.

And you know, we're trying to make this incredible

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00:04:22,720 --> 00:04:26,720

machine, which is the Space Station, work so that we can support the mission and all

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00:04:26,720 --> 00:04:33,720

the science we do on board.

Thank you so much. It's a great question.

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00:04:36,500 --> 00:04:42,000

And I would like to say that the development of the biological sciences and natural sciences

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00:04:42,000 --> 00:04:49,000

and studying in these areas is one of the most dominant trends here on board the Station.

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00:04:51,220 --> 00:04:58,220
It is very important if we are going to explore other planets, go into the deep space. Of

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00:04:58,380 --> 00:05:05,380
course, it is very important in the long perspective. It's very important to understand how biological

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00:05:07,990 --> 00:05:14,990
subjects behave in space. I mean people, how microgravity and space

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00:05:15,250 --> 00:05:22,250
environment impacts our bodily functions. And also it is imperative for us to understand

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00:05:23,680 --> 00:05:30,680
how plants will develop on board space ships during the long duration of flights.

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00:05:31,340 --> 00:05:38,340
How can we get nourishment and food from what sources? How can we plant colonies on other

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00:05:41,430 --> 00:05:48,430
planets? So, I can go on and on. So, it's one of the most important trends in our activities

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00:05:51,080 --> 00:05:58,080
here on board the Station. Thank you so much. When I was a school girl, I was little girl.

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00:06:05,090 --> 00:06:12,090
I was inspired by people who were actually fascinated by space. For example, I had a

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00:06:15,030 --> 00:06:22,030
teacher who was fascinated and thrilled by space and was telling us a lot about space

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00:06:22,440 --> 00:06:29,000
exploration, about cosmonauts and astronauts.
That's how my small history started. The reason

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00:06:29,000 --> 00:06:35,670
I'm telling you this because now when I am
here on board the Station, when I am a cosmonaut

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00:06:35,670 --> 00:06:42,670
and even before the flight, I started telling
children and kids what is happening in spaces.

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00:06:47,040 --> 00:06:53,170
In space exploration all over the world, what's
happening on board the Station, I started

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00:06:53,170 --> 00:07:00,170
to involve children into discussions about
astronomy. So, I am doing everything I can

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00:07:01,800 --> 00:07:08,080
in order to make children fall in love with
the sky and space.

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00:07:08,080 --> 00:07:13,930
I know that among those small kids there are
future engineers, professors, geniuses, and

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00:07:13,930 --> 00:07:20,930
scientists. So, I think we have to tell them
about space. It's absolutely imperative that

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00:07:23,540 --> 00:07:30,540
kids should here this at this stage.
They are all talented. I am sure that in the

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00:07:33,020 --> 00:07:40,020
future, they will invest a lot of their knowledge
into the development of the science.

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00:07:41,950 --> 00:07:48,950
And I totally and fully agree. Just like Yelena,
I also, as a school kid, I wasn't ready. You

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00:07:50,290 --> 00:07:56,500
know, I had my eyes set to--onto space. I
decided when I was very young that I wanted

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00:07:56,500 --> 00:07:59,720
to go to space.
I think it was a combination of things. I

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00:07:59,720 --> 00:08:06,060
had great teachers already in elementary school
who taught me about, you know, the sun, the

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00:08:06,060 --> 00:08:13,060
moon, the planets, in a very fascinating way.
I read science fiction books and general adventure

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00:08:14,360 --> 00:08:18,980
books, you know, Jules Verne, books about
exploring and big adventures.

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00:08:18,980 --> 00:08:25,980
And that just captured my fancy as a child.
And then as I grew a little bit older, I got

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00:08:26,090 --> 00:08:33,090
more and more interested in science and technology
and then in flying and aviation and even in

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00:08:33,550 --> 00:08:37,630
languages and, you know, and living in different
countries and cultures.

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00:08:37,630 --> 00:08:44,630
And all of that is part of this incredible
journey of being an astronaut, training as

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00:08:44,700 --> 00:08:49,100
an astronaut first, and now being on the space station. It kind of all comes together. All

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00:08:49,100 --> 00:08:53,800
these big passions, all these things that I'm passionate about kind of come together

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00:08:53,800 --> 00:08:58,510
in this one incredible experience. And all I can do when I try to do as much

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00:08:58,510 --> 00:09:04,730
as I can is to convey my enthusiasm about it and talk as much as I can about it. Also

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00:09:04,730 --> 00:09:10,220
with, you know, social media, we have this incredible opportunity now of being able to

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00:09:10,220 --> 00:09:14,560
reach to many people through new communication technologies.

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00:09:14,560 --> 00:09:21,420
And I do hope, of course, that maybe, you know, one kid or two will be inspired by it

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00:09:21,420 --> 00:09:27,550
to pursue a similar career. Wasn't that great? Those are two special women

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00:09:27,550 --> 00:09:34,040
in a very special place. And yet, I think you saw that they're a lot like you and me.

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00:09:34,040 --> 00:09:38,250
Thanks, Cady. Samantha and Yelena are shining examples of

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00:09:38,250 --> 00:09:44,760
the many women around the world making huge contributions in space exploration. The program

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00:09:44,760 --> 00:09:49,680
you're about to see features a group of NASA women who are making a difference right now

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00:09:49,680 --> 00:09:54,810
on Earth and in space.
Together, these are the women who will inspire

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00:09:54,810 --> 00:10:00,760
future generations of explorers to pursue their dreams, as I did. I think you'll agree

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00:10:00,760 --> 00:10:05,080
that they already are.
Every day at NASA we're working harder than

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00:10:05,080 --> 00:10:10,130
ever to send humans farther into the Solar System than ever before. And meanwhile, we're

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00:10:10,130 --> 00:10:14,190
making critical observations of our home planet and how it's changing.

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00:10:14,190 --> 00:10:19,820
We're using robotic explorers like the Hubble Space Telescope and the Curiosity Rover to

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00:10:19,820 --> 00:10:25,130
help us find answers to our most fundamental questions. How did we get here? Where are

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00:10:25,130 --> 00:10:30,240
we going? And are we alone?
All of this work could not be accomplished

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00:10:30,240 --> 00:10:37,240

without bright and enthusiastic people, scientists, engineers, technologists, mathematicians,

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00:10:37,400 --> 00:10:43,940

businessmen and women, and communicators, and many, many more. These skills are fundamental,

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00:10:43,940 --> 00:10:49,370

not only for NASA's missions, but also for the global space exploration that we're doing.

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00:10:49,370 --> 00:10:54,840

Today, I'm joined by three women who are leading the way for NASA, and they work on a variety

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00:10:54,840 --> 00:11:00,050

of different projects. Our discussion will focus on how science, technology, engineering,

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00:11:00,050 --> 00:11:06,100

and mathematics, or STEM, education, training, and skills, have led them to successful careers

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00:11:06,100 --> 00:11:10,400

at NASA. These three women are leading the way as NASA

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00:11:10,400 --> 00:11:15,600

blazes a trail deeper into the Solar System with our ultimate goal of sending human explorers

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00:11:15,600 --> 00:11:22,310

to Mars. Mamta Nagaraja works in Science Communication

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00:11:22,310 --> 00:11:28,740

in NASA's Science Mission Directorate. LaNetra Tate is Principal Investigator for Advanced

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00:11:28,740 --> 00:11:35,440

Manufacturing and Nanotechnology in NASA's
Space Technology Mission Directorate. And

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00:11:35,440 --> 00:11:41,220

Tara Ruttley is Associate Program Scientist
for the International Space Station.

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00:11:41,220 --> 00:11:44,550

You each have very different roles here at
NASA, and each of you got to where you are

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00:11:44,550 --> 00:11:49,020

through a very different path. So, I'm hoping
that we could just kind of start our discussion

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00:11:49,020 --> 00:11:53,680

today by hearing a little bit of--from each
of you about how you started at NASA because

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00:11:53,680 --> 00:11:56,510

that's a question that people often ask me,
at least.

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00:11:56,510 --> 00:12:01,830

You know, how do you start working at NASA?
What's the beginning? And so, I was hoping

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00:12:01,830 --> 00:12:05,190

that each of you could just tell us a little
bit about the beginning of your career. And

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00:12:05,190 --> 00:12:08,210

then later we'll talk more about how your
careers have changed over time.

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00:12:08,210 --> 00:12:10,550

So, Mamta, let's start with you.
Sure.

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00:12:10,550 --> 00:12:15,890

So, the short answer is I started at NASA because of the student programs. And Johnson

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00:12:15,890 --> 00:12:19,690

Space Center has a co-op program, and now it's called the NASA Pathways Program. And

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00:12:19,690 --> 00:12:23,650

what that means is you go to school for a semester, and then you go to work for a semester.

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00:12:23,650 --> 00:12:27,960

And you go vice versa until you graduate. So, you delay graduation a little bit. But,

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00:12:27,960 --> 00:12:32,690

the upside is you get experience at NASA doing actual real work in whatever field you've

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00:12:32,690 --> 00:12:37,830

chosen, whether that's technical or nontechnical. But, if I can step back a little bit further,

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00:12:37,830 --> 00:12:42,940

I'd say I started at NASA because I had a sister who was interested in science. And

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00:12:42,940 --> 00:12:47,990

she was in awe of the space program back in the early '80s. And that's when Sally Ride

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00:12:47,990 --> 00:12:51,670

was--had just gone up into space. And she was seven years old herself. And I

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00:12:51,670 --> 00:12:57,630

think I was three. And I was inspired by her because she would bring that back to us. And

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00:12:57,630 --> 00:13:01,000

the more I saw her get into science, the more I got into science.

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00:13:01,000 --> 00:13:05,610

And then she kind of grew out of it. And I just delved into it. And it was all I wanted

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00:13:05,610 --> 00:13:09,740

to do. I was interested in the world around me, answering the questions of why. I must

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00:13:09,740 --> 00:13:14,070

have been so annoying as a little girl because I would just ask, but why is it green? Well,

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00:13:14,070 --> 00:13:17,010

why? Why do leaves change colors? Why do they fall from the tree?

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00:13:17,010 --> 00:13:21,310

And it was just answering the why. So, I think that's really what led me to NASA.

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00:13:21,310 --> 00:13:23,540

Excellent. I like that. LaNetra, how about you?

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00:13:23,540 --> 00:13:29,560

So, I grew up in Florida. So, I grew up around the Kennedy Space Center and seeing a space

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00:13:29,560 --> 00:13:34,590

shuttle launch and opportunity that I share with my parents. And it was very exciting

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00:13:34,590 --> 00:13:38,370

for me.

Then I had the opportunity doing my PhD work

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00:13:38,370 --> 00:13:42,339

at University of South Florida to actually work with scientists and engineers at the

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00:13:42,339 --> 00:13:46,360

Ames Research Center.

So, I had that connection to be able to work

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00:13:46,360 --> 00:13:51,330

with scientists and engineers and gain that inspiration, that motivation to say, wow,

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00:13:51,330 --> 00:13:56,630

what I'm working on is somehow contributing at that point to a NASA mission.

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00:13:56,630 --> 00:14:03,250

And so, I was fortunate enough to join Kennedy Space Center when I received my PhD in 2005

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00:14:03,250 --> 00:14:10,250

and was able to do so many hands on activities and projects as well as actually--now that

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00:14:10,720 --> 00:14:16,089

I've watched the space shuttle launch from afar, now I could see it up close behind the

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00:14:16,089 --> 00:14:18,589

gates of NASA.

So, that's how I started.

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00:14:18,589 --> 00:14:21,510

Very cool. And, Tara, what about you?

Yeah.

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00:14:21,510 --> 00:14:26,990

So, I've always loved science from a young age. I think it--I think second grade is when

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00:14:26,990 --> 00:14:33,230

I wanted to come to work for NASA. Okay. I actually loved dinosaurs and space. But, who

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00:14:33,230 --> 00:14:36,850

doesn't?

So, I took the space. And growing up, people

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00:14:36,850 --> 00:14:39,850

told me, well, if you want to go work for NASA, you need to be an engineer. And you

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00:14:39,850 --> 00:14:44,200

need to do well in school. And you need to study your math and get your engineering stuff

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00:14:44,200 --> 00:14:47,589

done.

But, when I got into high school, I really

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00:14:47,589 --> 00:14:54,460

fell in love with biology when we dissected a cat. And I love cats. Don't get me wrong.

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00:14:54,460 --> 00:15:00,160

Right? But, that's nature's best design. That's not a feat of mechanical engineering. That's

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00:15:00,160 --> 00:15:03,110

nature.

And so, I really understood from then on I

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00:15:03,110 --> 00:15:08,800

really wanted to study science, biological sciences, life sciences, in the space realm

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00:15:08,800 --> 00:15:12,560

because I think that gets at the core of trying to solve what we all want to know, right?

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00:15:12,560 --> 00:15:15,550

Who are we? Where are we from?

It's philosophical. But, it's interesting.

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00:15:15,550 --> 00:15:20,050

Like, Mamta said, don't you want to know about the world around you? What is this we're part

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00:15:20,050 --> 00:15:27,050

of? So, I was able to go to college. I pursued biology. And while I was a student, I participated

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00:15:27,520 --> 00:15:31,920

in all of the NASA student programs that we could ever possibly participate in.

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00:15:31,920 --> 00:15:37,860

I took every opportunity and was very fortunate to get hired on at NASA out of my Master's

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00:15:37,860 --> 00:15:43,339

degree. Ironically, my Master's degree ended up being in engineering because as I was going

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00:15:43,339 --> 00:15:48,740

through my biology degree, I realized to really get some of the points across that I wanted

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00:15:48,740 --> 00:15:53,029

to get across, I needed to understand some engineering, some hardware, right?

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00:15:53,029 --> 00:15:59,600

So, I went to work for NASA as an engineer in biomedical engineering, though. So, yeah.

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00:15:59,600 --> 00:16:01,690

Wow.

Very interesting. It sounds like you all kind

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00:16:01,690 --> 00:16:07,630

of are very curious people, which was part of the formula, I think, for getting a start

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00:16:07,630 --> 00:16:12,040

at NASA.

And so, Mamta, I have to bring this up because

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00:16:12,040 --> 00:16:16,620

this is really cool. You were a semifinalist in the 2013 astronaut selection.

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00:16:16,620 --> 00:16:20,730

Both Tara and I actually [unintelligible].

Oh, excellent. Very cool.

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00:16:20,730 --> 00:16:26,230

So, I'm curious. What is it that made you want to do that? And then also what do you

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00:16:26,230 --> 00:16:32,660

think it's going to take? What is the traits and characteristics of what's going to be

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00:16:32,660 --> 00:16:36,170

needed for the first human crewed mission to Mars?

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00:16:36,170 --> 00:16:41,320

Oh, boy. Yes.

So, what was the first part of the question?

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00:16:41,320 --> 00:16:42,500

Why did you want to--?

--Why--?

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00:16:42,500 --> 00:16:45,080

Yeah.

Why did I want to do it? So, for me, I think

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00:16:45,080 --> 00:16:49,910

it's exploring the unknown, not knowing it.
It all goes back to the curiosity question,

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00:16:49,910 --> 00:16:55,600

the why. What's out there? And if we can push
the boundaries, why don't we push the boundaries?

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00:16:55,600 --> 00:16:59,360

How can we get there? What do we need to get
there? So, these are the different things

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00:16:59,360 --> 00:17:04,110

that delved me into wanting to apply for the
astronaut candidate program.

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00:17:04,110 --> 00:17:09,589

Plus, I think it--just a little side of me,
I think it'd be really fun to see Earth from

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00:17:09,589 --> 00:17:14,980

that vantage point. There are very few people
in this world who can say they've seen our

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00:17:14,980 --> 00:17:20,380

home. And that's--I think that for me would
be the personal reason why, aside from the

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00:17:20,380 --> 00:17:25,380

technological reasons and the scientific reasons.
I would love to see our home from that view.

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00:17:25,380 --> 00:17:27,800

That's true.
I've only seen it in a picture, like most

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00:17:27,800 --> 00:17:32,610

of us. What would it be like to see it with
our own eyes?

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00:17:32,640 --> 00:17:34,610

Very cool.

The characteristics I think it'll take for

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00:17:34,610 --> 00:17:39,809

somebody, and Tara, please jump in whenever you think of something that I haven't said

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00:17:39,809 --> 00:17:43,780

or bounce off of each other. I think for one, it's a long trip.

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00:17:43,780 --> 00:17:48,550

So, you're going to need somebody who can handle that psychologically. You're not--you'll

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00:17:48,550 --> 00:17:53,059

only be around your crewmembers, and you'll be in something larger than a tin can because

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00:17:53,059 --> 00:17:57,309

we've gotten better at building these spaceships. But, it's still a confined space. And you're

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00:17:57,309 --> 00:18:00,270

around the same people. So, I think you'll also need somebody who

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00:18:00,270 --> 00:18:04,920

can work on a team. So, if you're somebody who can't really be around people, that may

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00:18:04,920 --> 00:18:09,220

not be the job that you'd want to go all the way to Mars. We're talking about no less than

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00:18:09,220 --> 00:18:13,720

six months one way, no less than that, depending on how propulsion technology advances from

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00:18:13,720 --> 00:18:18,370

here to when we actually build the ship that'll go.

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00:18:18,370 --> 00:18:23,200

What other things do you think Tara?

I think you need to be flexible and be ready

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00:18:23,200 --> 00:18:29,960

to accept anything. And, you know, obviously, NASA does everything as safely as possible,

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00:18:29,960 --> 00:18:34,429

and we think about--we try to anticipate every possible scenario.

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00:18:34,429 --> 00:18:40,140

But, I think you need to be in touch with who you are and your life and the world around

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00:18:40,140 --> 00:18:45,400

you, philosophically speaking. And also be ready for anything and be flexible, not just

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00:18:45,400 --> 00:18:51,480

the personalities, but how good at you are--how confident are you in making decisions that

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00:18:51,480 --> 00:18:56,030

are maybe life or death or, you know, don't cut the red wire, cut the blue wire, those

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00:18:56,030 --> 00:18:59,970

kind of things, right?

So, I think just be able to be a--make good

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00:18:59,970 --> 00:19:05,110

judgment calls. Be a good team member. I think those were the things.

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00:19:05,110 --> 00:19:08,670

Excellent. Thank you.

And LaNetra, in your title, we mentioned a

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00:19:08,670 --> 00:19:15,010

big word, nanotechnology. I'm wondering if--for my benefit and others, if you could give us

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00:19:15,010 --> 00:19:20,490

a quick kind of 101 on what is nanotechnology and why should we care about it?

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00:19:20,490 --> 00:19:27,490

So, nanotechnology is essentially the STE, and of course, the M in STEM, the science,

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00:19:27,580 --> 00:19:32,390

technology, engineering, conducted at the nano scale. So, that's around one to 100 nanometers.

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00:19:32,390 --> 00:19:39,360

So, if you think about a sheet of paper, it's about 100,000 nanometers thick. Or your hair

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00:19:39,360 --> 00:19:46,360

is somewhere around 80,000 to 100,000 nanometers in diameter. So, we look at this science,

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00:19:49,230 --> 00:19:56,230

this field of science, to help us in areas in light weighting material, vehicles, potential

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00:19:58,000 --> 00:20:05,000

shielding, if we could get aluminum shielding, enhance that a little bit more, high speed

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00:20:07,470 --> 00:20:13,270

computing with nanoelectronics.

So, NASA's delving in many areas in nanotechnology.

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00:20:13,270 --> 00:20:20,270

And we have been for quite a while. But, in our everyday life, we've, you know--nano has

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00:20:20,460 --> 00:20:27,460

found its way into sporting equipment. It found its way into corrosion material for

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00:20:28,640 --> 00:20:33,690

corrosion resistant material.

So, nano is--has been around for many, many

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00:20:33,690 --> 00:20:40,690

years, many, many decades, many, many centuries.

And it started with Richard Feynman and understanding

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00:20:42,250 --> 00:20:49,250

the power of small. So, nanotechnology, much of nanotechnology is core in STEM applications.

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00:20:49,790 --> 00:20:55,920

Very cool. Thank you. That's a great explanation.

I think I get it. Yeah.

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00:20:55,920 --> 00:21:01,250

So, Tara, I was wondering if you could tell us a little bit more about the space station.

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00:21:01,250 --> 00:21:05,280

One of the things that I think very few people realize is that we're actually conducting

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00:21:05,280 --> 00:21:11,809

scientific research there all the time.

And it's, you know, experiments, plant biology,

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00:21:11,809 --> 00:21:15,640

combustion, all these big, you know, exciting types of experiments. But, then there's also

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00:21:15,640 --> 00:21:21,799

this whole category of work being done up there in which the astronauts are the experiment.

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00:21:21,799 --> 00:21:27,100

They're the actual subject.

And since you have this background in exercise

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00:21:27,100 --> 00:21:30,350

physiology and neuroscience, I was just wondering if you could tell us a little bit about what

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00:21:30,350 --> 00:21:33,360

we're learning about humans and human health in space.

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00:21:33,360 --> 00:21:36,640

Oh, yeah.

I'm so--I could talk for a whole hour on that.

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00:21:36,640 --> 00:21:42,860

But, the space station is the coolest laboratory you'll ever, ever get to participate with

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00:21:42,860 --> 00:21:49,500

or in. I mean it's all of our labs, right?

And so, you know, the human body is the most

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00:21:49,500 --> 00:21:54,020

obvious thing that changes up there, right?

We are creatures of a gravity environment.

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00:21:54,020 --> 00:21:57,400

We're developed for Earth.

So, the second you get off the planet, things

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00:21:57,400 --> 00:22:02,030

start to change. Your body--your--you know, you get motion sick because your inner ear,

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00:22:02,030 --> 00:22:06,250

the fluids in your inner ear kind of get confused.
Your eyes get confused because there's no

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00:22:06,250 --> 00:22:08,920

up and down.
There's no pressure on the bottom of your

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00:22:08,920 --> 00:22:13,520

feet. So, you're floating. And so, your body
doesn't know which way is up. And it kind

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00:22:13,520 --> 00:22:18,520

of makes you a little ill. And over time,
because you're not standing up all the time,

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00:22:18,520 --> 00:22:22,910

you lose bone and muscle if you don't exercise
because, again, we're creatures of Earth.

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00:22:22,910 --> 00:22:26,370

Your body's really good at getting rid of
whatever it doesn't need to maintain. Your

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00:22:26,370 --> 00:22:32,750

immune system changes. You may get sicker
quicker. Let's see. We've got vision issues.

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00:22:32,750 --> 00:22:37,440

Some of the fluids shift to your head and
get puffy face, which makes it hard for some

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00:22:37,440 --> 00:22:42,010

of the astronauts to see very clearly.
But, so, there are lots of changes that happen

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00:22:42,010 --> 00:22:47,490

in the human body. And we're the most obvious
change. But, across the whole scientific spectrum,

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00:22:47,490 --> 00:22:53,809

we have little microorganisms that change.
Like, bacteria, some become more aggressive.

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00:22:53,809 --> 00:22:57,260

Some become more, you know, stationary, don't
do anything at all.

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00:22:57,260 --> 00:23:01,380

But, we've seen some microbes, some bacteria
survive the environment of the outside of

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00:23:01,380 --> 00:23:06,799

space station. And so, they're--it's really
interesting. When you talk about the nanotechnology,

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00:23:06,799 --> 00:23:11,020

the particles, she's talking about things
that--you know, nanotechnology and materials

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00:23:11,020 --> 00:23:15,460

that you can see and touch based on what we
know here about Earth's gravity.

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00:23:15,460 --> 00:23:20,860

But, you send those particles up to space
by themselves where there's no gravity forcing

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00:23:20,860 --> 00:23:25,480

certain interactions, these little, tiny particles
will start to behave in ways you would never

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00:23:25,480 --> 00:23:28,960

have predicted.
They can assemble themselves. They can disassemble.

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00:23:28,960 --> 00:23:35,960

They can form brand-new structures we've never
seen before. So, using that research laboratory

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00:23:36,070 --> 00:23:40,780

as a way by which, you know, think of any science experiment you've ever done on earth

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00:23:40,780 --> 00:23:45,429

and take gravity out of that equation. What could you possibly get out of that? Sometimes

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00:23:45,429 --> 00:23:52,000

we don't even know. We just sent up some worms that we cut their body parts off, right, because

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00:23:52,000 --> 00:23:55,370

we know that worms can regenerate here on Earth. How could they do that in space?

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00:23:55,370 --> 00:23:58,390

So, isn't that something we always want to know? What would happen if? What would happen

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00:23:58,390 --> 00:24:04,169

if? So, now we have the opportunity to send new and cool and interesting science experiments

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00:24:04,169 --> 00:24:10,200

up to the space station and get some fascinating things out of that.

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00:24:10,200 --> 00:24:16,160

So, Mamta, you said your new job, your title in the introduction is you're working on science

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00:24:16,160 --> 00:24:19,440

communication. That's something that you know I care a lot about as well. I work in that

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00:24:19,440 --> 00:24:22,540

as well. And I was just kind of curious. How did you

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00:24:22,540 --> 00:24:26,820

get into that? And I mean it's pretty different than mechanical engineering. I'm just wondering

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00:24:26,820 --> 00:24:30,850

what type of science communication are you working on? And why are you doing it now?

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00:24:30,850 --> 00:24:33,980

Yes.

I would say that actually goes back to probably

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00:24:33,980 --> 00:24:39,360

around freshman year in high school, college--or excuse me--high school. We had it in our middle

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00:24:39,360 --> 00:24:44,010

school timeframe back then.

And I had an English teacher who actually

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00:24:44,010 --> 00:24:48,770

is the one who told me to go into engineering.

And I grew up in a small town in West Texas.

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00:24:48,770 --> 00:24:53,210

And nobody came to our school to tell us what--I didn't know. I thought engineers drove trains.

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00:24:53,210 --> 00:24:55,510

I mean that is literally what I thought engineers did.

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00:24:55,510 --> 00:24:59,320

So, I didn't know quite what engineering was.

But, my English teacher had told me about

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00:24:59,320 --> 00:25:05,320

this primarily because I was good in math and science. But, the reason she told me that

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00:25:05,320 --> 00:25:09,960

I would be a good engineer is because I was really good in her class, which was English.

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00:25:09,960 --> 00:25:13,780

And it's because I understood how to communicate. I understood the importance of being able

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00:25:13,780 --> 00:25:18,890

to write, which by the way, if anyone does go into a technical field, somebody who knows

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00:25:18,890 --> 00:25:24,210

how to communicate both verbally and written will excel beyond all of those other people

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00:25:24,210 --> 00:25:28,390

around you because most of the people in those fields can't do that.

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00:25:28,390 --> 00:25:33,520

So, you having those skills makes you stand out above them. So, I think I've always taken

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00:25:33,520 --> 00:25:38,250

towards being able to talk about what I'm doing. And I do enjoy it. I have all of my

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00:25:38,250 --> 00:25:41,929

degrees are in technical fields. And I actually enjoy the technical aspect

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00:25:41,929 --> 00:25:46,490

as well. I like getting hands on and taking something apart and putting it back together.

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00:25:46,490 --> 00:25:51,410

If something's broken, like you were talking about on the Space Station or even making

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00:25:51,410 --> 00:25:55,460

a part for something that's broken, going long distance. I enjoy those kinds of things.

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00:25:55,460 --> 00:26:00,750

But, I think another part of me enjoys just as much being able to tell people about those

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00:26:00,750 --> 00:26:05,140

things and being able to tell them in a way where maybe they might care about it, so relating.

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00:26:05,140 --> 00:26:09,530

And I think that's what communications is. It's conveying what we do here at NASA in

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00:26:09,530 --> 00:26:15,040

a way that people can relate to it. So, why do you care that we're talking about 3D printing?

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00:26:15,040 --> 00:26:19,090

Why does that matter to you, you being the general person in the public?

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00:26:19,090 --> 00:26:20,840

And I think that's really what science communications is.

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00:26:20,840 --> 00:26:23,559

Excellent. Thanks. It sounds like pretty exciting work.

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00:26:23,559 --> 00:26:25,710

It is exciting. I'm excited for you.

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00:26:25,710 --> 00:26:27,490

Yeah. Very cool.

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00:26:27,490 --> 00:26:32,080

And, Tara, speaking of communicating with the public and telling the story of NASA,

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00:26:32,080 --> 00:26:37,240

we've got a pretty big story coming up this year. We've got the first one-year on the

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00:26:37,240 --> 00:26:37,950

space station.

Yeah.

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00:26:37,950 --> 00:26:41,760

That's going to be happening in 2015. I'm wondering if you could tell us a little bit

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00:26:41,760 --> 00:26:45,490

more about what to expect during that mission and why it's important.

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00:26:45,490 --> 00:26:48,470

Yeah.

So, yeah, that's right. So, we have our first

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00:26:48,470 --> 00:26:53,260

one-year crew going to the space station.

They launch on the 27th. So, what's that?

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00:26:53,260 --> 00:26:54,540

This week, Friday?

Friday.

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00:26:54,540 --> 00:26:59,730

Wow, Scott Kelly and Mikhail Kornienko, oh, my gosh. I always butcher his last name. I

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00:26:59,730 --> 00:27:05,390

apologize. They're going up. They are going to stay for a year. Most astronauts stay and

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00:27:05,390 --> 00:27:07,820

cosmonauts will stay for six months month
at a time.

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00:27:07,820 --> 00:27:10,820

But, they'll be there for a year, which will
give us some critical science data points

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00:27:10,820 --> 00:27:16,880

as to what happens to the human body the longer
you stay. There have been a handful of cosmonauts

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00:27:16,880 --> 00:27:21,210

who've stayed in space longer than a year.
But, this will be the first time actual planned

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00:27:21,210 --> 00:27:25,299

systematic data is going to be collected.
So, what happens to the immune system? What

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00:27:25,299 --> 00:27:29,120

happens to the bones? What happens to the
muscles? What happens to your body as you

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00:27:29,120 --> 00:27:34,820

get past .6 months and past a year? Do things
stabilize? Do they get worse? Do they get

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00:27:34,820 --> 00:27:38,010

better? We don't know.
But, it'll be interesting psychologically

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00:27:38,010 --> 00:27:43,669

too to see how these crews will interact.
Those guys will be up for a year. But, in

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00:27:43,669 --> 00:27:48,020

the meantime, you'll have different crew members
rotating through the station throughout their

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00:27:48,020 --> 00:27:52,809

one-year space.

So, I think it'll be interesting scientifically

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00:27:52,809 --> 00:27:58,740

when the results come back. Also, Scott Kelly has a twin brother who used to be an astronaut.

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00:27:58,740 --> 00:28:02,890

He's now going to be looked at, at the same time, on the ground, kind of running parallel

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00:28:02,890 --> 00:28:08,780

studies on the twins on how the astronaut in space is doing as opposed to the twin on

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00:28:08,780 --> 00:28:11,710

the ground.

And the twin, Mark Kelly, has flown before

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00:28:11,710 --> 00:28:17,559

too. So, interesting science, fun stuff, I think very new and exciting things, things

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00:28:17,559 --> 00:28:21,230

that scientists may never have seen yet. That's another really cool thing about getting to

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00:28:21,230 --> 00:28:26,919

work on the Space Station, is you see a lot of new science that nobody's ever seen before.

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00:28:26,919 --> 00:28:30,600

So, could you imagine being the first one to see some kind of new data that you get

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00:28:30,600 --> 00:28:34,700

to make sense out of? So, that'll be really fun. Yeah.

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00:28:34,700 --> 00:28:38,840

Excellent. Very cool.

Now we talked at the beginning about how each

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00:28:38,840 --> 00:28:43,880

of you started your career at NASA. And now

I'd like to kind of shift gears into sort

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00:28:43,880 --> 00:28:46,870

of how your careers have changed. I mean we've

touched on it a little bit.

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00:28:46,870 --> 00:28:53,870

But, I think it's--at least for me, it's always

really important to kind of reflect on how

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00:28:54,410 --> 00:28:58,299

even though we might have like kind of one

what seems to be a very obvious path when

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00:28:58,299 --> 00:29:03,340

we're young and when we're just getting started

in school or choosing a major, choosing a

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00:29:03,340 --> 00:29:07,990

first career.

It, at the time, can feel like that's it for

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00:29:07,990 --> 00:29:14,690

the rest of your life, right? But, I think

what's so liberating is getting to then change

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00:29:14,690 --> 00:29:18,660

your mind and make a different choice and

choose a different career path.

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00:29:18,660 --> 00:29:22,960

I mean I started out as a scientist. And then

I became a filmmaker. And now I work in science

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00:29:22,960 --> 00:29:28,850

communication. And I know each of you has kind of like a similar, you know, story. And

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00:29:28,850 --> 00:29:31,460

so, I'm just wondering if you could tell us a little bit about sort of how your careers

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00:29:31,460 --> 00:29:37,799

have changed and what that's been like for I'll start.

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00:29:37,799 --> 00:29:43,340

So, in high school, I was part of the International Baccalaureate Program. I was one of the first

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00:29:43,340 --> 00:29:49,419

cohorts in our county, Hillsborough County, Florida. And course work, very challenging,

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00:29:49,419 --> 00:29:54,799

very intense, and by far, chemistry was my most challenging.

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00:29:54,799 --> 00:30:01,429

So, I decided to conquer that and majored in chemistry. So, I got my undergrad in chemistry

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00:30:01,429 --> 00:30:06,890

as well as my PhD work in chemistry. And so, I--when I started at Kennedy Space Center,

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00:30:06,890 --> 00:30:13,890

I worked in conductive systems and carbon nanotube technology, a lot of chemistry.

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00:30:15,549 --> 00:30:22,549

And throughout the years, I have moved to more engineering type work. And now at headquarters,

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00:30:23,620 --> 00:30:29,150

I'm essentially a champion or advocate for other scientists, other engineers and their

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00:30:29,150 --> 00:30:33,230

technology.

So, that really at times I step out of my

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00:30:33,230 --> 00:30:38,910

comfort zone of what I was trained to do.

And my husband always likes to introduce me

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00:30:38,910 --> 00:30:43,230

as a rocket scientist. And I always tell him, no, I'm really not. I'm just a chemist.

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00:30:43,230 --> 00:30:50,230

But, you know, I have to talk to the propulsion engineer. I have to talk to the metal engineer,

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00:30:50,900 --> 00:30:56,429

the metallurgist engineer. And so, I have to step out of my comfort zone so much. And

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00:30:56,429 --> 00:31:02,460

I think that back in high school and undergrad where I decided to conquer that challenge

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00:31:02,460 --> 00:31:08,440

of chemistry makes me so much more comfortable stepping out.

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00:31:08,440 --> 00:31:13,620

And it goes back to that communication, being able to communicate and understand different

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00:31:13,620 --> 00:31:19,500

areas to talk across several different technology areas. I'm still in technology.

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00:31:19,500 --> 00:31:26,020

But, I'm not necessarily mixing chemicals in the lab. I'm actually talking across a

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00:31:26,020 --> 00:31:31,820

broader community.

So, for me, I think that the answer comes

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00:31:31,820 --> 00:31:35,730

in what I was told in high school. I grew up in Louisiana. We made a field trip to the

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00:31:35,730 --> 00:31:40,400

Johnson Space Center. And we got to meet an astronaut. And I said, so, what does it take

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00:31:40,400 --> 00:31:44,340

to be an astronaut.

And he said, well, just enjoy what you're

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00:31:44,340 --> 00:31:48,370

doing because whatever it is you--do what you love, right? Because if you do what you

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00:31:48,370 --> 00:31:52,679

love, you'll, be successful at it.

And so, I took that, and I constantly kept

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00:31:52,679 --> 00:31:57,010

that in the back of my mind. As it turns out, he was right. So, everything that I've done

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00:31:57,010 --> 00:32:03,440

up to this day is because I've enjoyed it.

And as that enjoyment comes success. And in

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00:32:03,440 --> 00:32:08,100

more success brings more opportunities. And more opportunities brings more fun.

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00:32:08,100 --> 00:32:12,610

And so, all of us are up here because we love what we do. When I came to work at NASA as

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00:32:12,610 --> 00:32:16,549

an engineer, it wasn't what I had planned. But, it was the perfect fit. Someone else

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00:32:16,549 --> 00:32:18,610

saw that in me that I didn't see. And that's another thing.

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00:32:18,610 --> 00:32:23,780

I have been able to trust my mentors or trust those who see things in me that I wouldn't

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00:32:23,780 --> 00:32:29,010

have otherwise seen. And then once I got here, I was able to--got to NASA, I was able to

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00:32:29,010 --> 00:32:33,440

pursue my PhD in neuroscience at the same time, working and going to school.

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00:32:33,440 --> 00:32:37,590

So, once I completed that PhD, I had been in engineering for about eight years. And

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00:32:37,590 --> 00:32:41,820

I thought, you know, it's time for a change. I'd like to do something in science. And that's

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00:32:41,820 --> 00:32:45,830

what I'm interested in. That's my passion. And I was fortunate enough to apply to this

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00:32:45,830 --> 00:32:49,950

position that I'm in now as Associate Program Scientist for Space Station. So, I don't wear

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00:32:49,950 --> 00:32:55,030

a laboratory coat. And I don't work in the labs anymore. But, I get to manage all the

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00:32:55,030 --> 00:32:56,620

research that happens on Station.
Yes.

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00:32:56,620 --> 00:33:01,460

You get to meet the scientists. You get to touch the stuff. You get to help train the

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00:33:01,460 --> 00:33:04,610

astronauts on the science that they're going to be doing. You get to see some of the first

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00:33:04,610 --> 00:33:09,039

results and then go out and communicate those results.

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00:33:09,039 --> 00:33:15,200

And Mamta is right. If you can be a good communicator, it's fundamentally what we do as human beings.

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00:33:15,200 --> 00:33:19,000

We have to communicate to each other. Sometimes we get it right. Sometimes we get it wrong.

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00:33:19,000 --> 00:33:22,860

And it's a challenge to get it right. But, if you don't get it right, you can see a lot

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00:33:22,860 --> 00:33:28,210

of consequences that happen. So, if you're good in English, then definitely take that

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00:33:28,210 --> 00:33:33,679

and apply it if you also have a love for science. If you're interested in mixed arts, physical,

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00:33:33,679 --> 00:33:38,750

musical arts, visual arts, and you have a love for science, there's ways that you can

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00:33:38,750 --> 00:33:42,970

marry both of them and be contributors to society while you're also self-fulfilled.

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00:33:42,970 --> 00:33:49,750

So, I live that every day. How can I be self-fulfilled? But, also, how can I contribute to America,

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00:33:49,750 --> 00:33:54,650

the world? And you just--I think all of us up here are just conscious of those things.

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00:33:54,650 --> 00:33:58,900

And again, if you just keep doing what you love, you can change paths. And you just keep

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00:33:58,900 --> 00:34:01,039

following where you're meant to go. Yeah.

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00:34:01,039 --> 00:34:08,039

If I could add, doing what you love reminds me of Katherine Johnson, who has joined NACA

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00:34:10,999 --> 00:34:16,029

when NASA was NACA back in the 1950s. And she was a mathematician. And she helped with

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00:34:16,029 --> 00:34:19,539

some of the trajectories of Project Mercury and Apollo 11.

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00:34:19,539 --> 00:34:25,309

And she started out as a teacher I think, right? And then she loved mathematics so much

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00:34:25,309 --> 00:34:30,599

that she came into a--since this is Women in STEM, a very male-dominated environment.

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00:34:30,599 --> 00:34:35,619

But, she loved mathematics so much. And she loved what she was doing that, you know, I

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00:34:35,619 --> 00:34:39,569

think NASA has always been an environment that really cultivates.

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00:34:39,569 --> 00:34:45,859

And you really love what you're doing. I think since I started day one, I've actually enjoyed

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00:34:45,859 --> 00:34:51,159

every job, every task, everything I've actually done. And so, you just think about Katherine

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00:34:51,159 --> 00:34:56,969

Johnson and all the other women that came before us in STEM fields, that they actually

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00:34:56,969 --> 00:35:00,210

loved what they did to contribute to NASA's larger role.

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00:35:00,210 --> 00:35:05,450

I'm glad you brought up Katherine Johnson because that's one of the things in science

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00:35:05,450 --> 00:35:11,539

communication we talk a lot about, increasing diversity and just sort of the face of science.

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00:35:11,539 --> 00:35:14,799

And I would expand that to technology and engineering as well.

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00:35:14,799 --> 00:35:17,670

Yes.

And you know, there have been many studies

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00:35:17,670 --> 00:35:21,539

showing that, you know, when kids are asked to draw a picture of a scientist, they often

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00:35:21,539 --> 00:35:24,739

come up with a singular look, sort of an Albert Einstein--.

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00:35:24,739 --> 00:35:26,619

--Right--.

--An older white man in a lab coat--.

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00:35:26,619 --> 00:35:27,569

--Right--.

--Crazy hair.

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00:35:27,569 --> 00:35:28,519

Right.

You know?

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00:35:28,519 --> 00:35:32,319

And obviously that's not a complete picture of what science looks like because--.

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00:35:32,319 --> 00:35:34,289

--Right--.

Here are the four of us. And I'm just kind

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00:35:34,289 --> 00:35:38,359

of curious. Maybe Mamta, if you could just chime in a little bit about what--how you

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00:35:38,359 --> 00:35:43,880

think the face of STEM has changed over the years and what we could do to really portray

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00:35:43,880 --> 00:35:47,660

a more complete picture?

You know, I think it parallels how our nation

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00:35:47,660 --> 00:35:51,940

has changed and largely how the world has changed as well. I think that picture used

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00:35:51,940 --> 00:35:56,569

to be accurate. I don't think any of us could argue that at one time, it did not represent

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00:35:56,569 --> 00:36:00,410

your average scientist.

But, I think we have changed as population,

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00:36:00,410 --> 00:36:06,450

both in this country and internationally.

And I think we represent how that change has

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00:36:06,450 --> 00:36:10,559

happened. I mean just visually look at us.

This is science today.

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00:36:10,559 --> 00:36:15,049

Those--the pictures that these students are drawing is--it's maybe because they haven't

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00:36:15,049 --> 00:36:20,559

been exposed to or haven't seen what current day science is like. But, when I--I mean,

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00:36:20,559 --> 00:36:25,430

in each of the different times that I've done hands on technical work, if I walk into the

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00:36:25,430 --> 00:36:29,979

lab, those labs look like us.

I mean, throw in some men, obviously, as well,

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00:36:29,979 --> 00:36:33,489

because obviously both men and women work in those labs. And you should. I think teams

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00:36:33,489 --> 00:36:40,200

of the combined group is actually the strongest group, when you have diverse minds and people

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00:36:40,200 --> 00:36:43,849

who come from different backgrounds, not just gender and not just race, but actually their

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00:36:43,849 --> 00:36:49,219

different backgrounds, how you grew up. You approach problems very differently. And

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00:36:49,219 --> 00:36:55,559

I think it's--I hope that someday as students realize that science has changed and they

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00:36:55,559 --> 00:36:58,479

come to these types of events, and they say, oh, that's really not what science looks like.

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00:36:58,479 --> 00:37:03,339

Now engineering looks like this. Then that picture will also change and evolve

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00:37:03,339 --> 00:37:07,700

the way that life has evolved, the way that our profession has evolved--.

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00:37:07,700 --> 00:37:09,759

--Yeah--.
--Our country has evolved.

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00:37:09,759 --> 00:37:11,920

Absolutely.
And I think it's also just super important

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00:37:11,920 --> 00:37:14,279

to have, you know, those role models--
--Yeah--.

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00:37:14,279 --> 00:37:19,599

--And those mentors. Like you said, if you
don't see other people who look like you in

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00:37:19,599 --> 00:37:23,380

a job that you might want to pursue, then
you might be discouraged from pursuing it.

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00:37:23,380 --> 00:37:27,650

I'm wondering if any of you have specific
mentors or role models that have been really

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00:37:27,650 --> 00:37:31,789

important to you in your careers. Tara, do
you want to start?

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00:37:31,789 --> 00:37:35,299

Yeah.
You know, it's interesting. I didn't actively

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00:37:35,299 --> 00:37:41,079

know I had any. I never actually thought I
had a role model. And I didn't realize this

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00:37:41,079 --> 00:37:47,229

until maybe a few years ago. I can now look
back at who has influenced my life, you know,

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00:37:47,229 --> 00:37:52,880

and mostly--you know, mostly the--mostly space
flight in general influenced my life growing

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00:37:52,880 --> 00:37:57,279

up.
But, when I got to NASA, it was my very first

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00:37:57,279 --> 00:38:03,809

manager who was a math major, African American female. And she managed a whole group of us

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00:38:03,809 --> 00:38:07,869

where there were only two of us who were women in the engineering group.

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00:38:07,869 --> 00:38:12,219

And that had no--I didn't think about that at the time. Big--you know, it wasn't a big

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00:38:12,219 --> 00:38:17,479

deal to me. But, then I got moved onto the next position and realized, whoa, she shaped

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00:38:17,479 --> 00:38:21,799

my life. She influenced me. She influenced others. That was a major impact. She encouraged

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00:38:21,799 --> 00:38:26,960

me to get my PhD, supported that. And now I'm in a field where my next major

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00:38:26,960 --> 00:38:32,549

mentor in my career is the Chief Scientist for our Space Station, Julia Robinson, and

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00:38:32,549 --> 00:38:39,549

a strong woman in science, a great communicator. I had some great mentorship through college

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00:38:39,710 --> 00:38:42,719

that I didn't know. So, I wouldn't--I wasn't actively seeking

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00:38:42,719 --> 00:38:47,630

things out. So, for me, mentorship was more passive. And I can look back now and probably

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00:38:47,630 --> 00:38:51,839

hand pick a few.

You know, and with regard to the scientist

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00:38:51,839 --> 00:38:57,700

look, the stereotypical scientist look, I

think another thing that females might think

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00:38:57,700 --> 00:39:03,099

about, young girls, is that scientists are

just born naturally smart and naturally able

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00:39:03,099 --> 00:39:08,329

to just do it, right? Dig in and love math

and love numbers and love data and get it,

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00:39:08,329 --> 00:39:12,660

get the graphs, get all that, get the charts.

It's not always true. Like, I wasn't born

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00:39:12,660 --> 00:39:17,059

naturally smart. I didn't always get the data

and the graphs right away. But, I was curious

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00:39:17,059 --> 00:39:22,539

enough to dig in and learn, learn how to do

it, learn how to read it, and not always the

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00:39:22,539 --> 00:39:25,039

brightest, and still not always the smartest

in the room.

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00:39:25,039 --> 00:39:29,640

But, if you just keep asking the questions,

there's no stupid questions. Just keep asking

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00:39:29,640 --> 00:39:33,989

and digging. I think that's another thing

that will create some of the better scientists

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00:39:33,989 --> 00:39:38,289

in our world.

Nice. Yeah. Any other mentors or role models

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00:39:38,289 --> 00:39:40,880

you guys want to name?

Yeah.

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00:39:40,880 --> 00:39:44,380

And I won't throw out names because I'm afraid I'd forget somebody, to be honest.

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00:39:44,380 --> 00:39:46,499

I know.

But, I will say--and it's kind of similar

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00:39:46,499 --> 00:39:50,900

to what Tara said. Looking back, I realize where the mentors were. And at the time, I

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00:39:50,900 --> 00:39:54,869

don't know. Some of the mentors weren't my formally assigned mentors. They were people

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00:39:54,869 --> 00:39:58,519

in the office who just really cared about me.

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00:39:58,519 --> 00:40:05,519

And I just--looking back, I think, wow, he really cared about me, my career, where I

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00:40:05,900 --> 00:40:10,690

was headed, pulled me aside at times and said, you know, I really think you should pursue

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00:40:10,690 --> 00:40:13,489

this opportunity. I think it's made for somebody like you.

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00:40:13,489 --> 00:40:15,459

And I would have never found that opportunity--.
--Right--.

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00:40:15,459 --> 00:40:18,849

--Had it not been for this particular mentor.
And, you know, in my head right now while

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00:40:18,849 --> 00:40:23,089

I'm talking to you, I can see the faces of
these people. But, I also--I mean the one

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00:40:23,089 --> 00:40:27,289

thing that strikes me the most is that none
of them had to do it.

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00:40:27,289 --> 00:40:32,209

None of them had to come up to me and say
apply for this scholarship because I think

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00:40:32,209 --> 00:40:36,349

you could get it and end up with a full scholarship
to college. I mean you know that person did

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00:40:36,349 --> 00:40:41,680

not have to do that for me.
So, for me, I always say mentoring is, at

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00:40:41,680 --> 00:40:47,039

least what I approach it, when I mentor people,
I think it's about wanting them to do better

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00:40:47,039 --> 00:40:51,130

than you did yourself. And that's really--that's
how I approach mentoring.

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00:40:51,130 --> 00:40:56,299

Great. LaNetra?
I think I have had extremely positive experiences

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00:40:56,299 --> 00:41:00,609

with mentors, starting with my mom and my dad. You know, the ultimate mentors are your

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00:41:00,609 --> 00:41:06,779

parents because I know with my parents, it's--you know, you can do anything you set your mind

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00:41:06,779 --> 00:41:09,819

to.
And I think, you know, there's always that

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00:41:09,819 --> 00:41:15,009

middle school, that high school mentor. And I--and for college, I went to a HBCU, a historically

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00:41:15,009 --> 00:41:22,009

black college or university. And so, being a minority in several senses, I had a, you

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00:41:22,579 --> 00:41:26,940

know, university campus full of mentors. I remember I was in the chemistry department.

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00:41:26,940 --> 00:41:31,579

And the chair of the department would make a point that all of his chemistry majors he

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00:41:31,579 --> 00:41:37,440

would call doctors. Dr. Clayton, so you'd walk down the--and that was my maiden name.

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00:41:37,440 --> 00:41:40,549

You'd walk down the campus, and he'd call you that.

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00:41:40,549 --> 00:41:47,200

So, that was the first inspiration of, oh, I can actually move forward. And as I joined

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00:41:47,200 --> 00:41:52,619

NASA, I've had, like you said, people who really care about you, both in the lab and

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00:41:52,619 --> 00:41:57,150

external at other centers, and both men and women.

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00:41:57,150 --> 00:42:03,059

I've had some really great women mentors. And I've had some really great men mentors.

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00:42:03,059 --> 00:42:08,309

So, it's really about those individuals that really care about you and say, you know, did

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00:42:08,309 --> 00:42:12,420

you think about this? And maybe you should think about this. And you really, really have

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00:42:12,420 --> 00:42:17,009

these skills. And these are your strengths. And these are also your weaknesses. And here's

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00:42:17,009 --> 00:42:20,489

how you could help, you know, improve those weaknesses.

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00:42:20,489 --> 00:42:23,579

So, I've had really great experiences with my mentors.

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00:42:23,579 --> 00:42:26,469

That's great. Thank you all so much for just sharing your

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story and your experiences about your careers, but also just kind of how you live your lives.

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00:42:32,539 --> 00:42:37,880

I think it's really inspiring to hear, you know, from such different perspectives and

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00:42:37,880 --> 00:42:43,269

about different jobs at NASA, obviously. It's just a very exciting time to be here

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00:42:43,269 --> 00:42:48,190

at NASA. It's a great place to work, obviously, as we've been hearing from our panelists.

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It's been recently named the best place to work in the federal government for the third

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year in a row now, which we're all very proud of.

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And I think a lot of that comes from the fact that we're all very passionate about what

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00:42:59,660 --> 00:43:04,479

we do. And you know, for people who are out there who are interested in learning about

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00:43:04,479 --> 00:43:09,269

other careers at NASA, we do have a lot of information about jobs and internships and

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00:43:09,269 --> 00:43:15,979

fellowships on our Web site and education opportunities as well at NASA.gov/education.

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00:43:15,979 --> 00:43:20,539

And I also would want to just mention we've been talking a lot about the International

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00:43:20,539 --> 00:43:23,529

Space Station today. And there's a lot of really good information on [NASA.gov/station](https://www.nasa.gov/station)

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00:43:23,529 --> 00:43:30,019

about what's happening in space right now and what we are learning from the science

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00:43:30,019 --> 00:43:33,329

experiments that we're doing there. If you want to follow NASA on social media

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00:43:33,329 --> 00:43:38,200

and enter a dialogue with some of our scientists and engineers and technologists, you can visit

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00:43:38,200 --> 00:43:42,940

[NASA.gov/connect](https://www.nasa.gov/connect). And then lastly, if you want to actually see

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00:43:42,940 --> 00:43:47,539

the Space Station in the sky, you can check out Spot the Station, which is a really good

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00:43:47,539 --> 00:43:53,369

resource for finding out when the Space Station is going to be passing over your local area.

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00:43:53,369 --> 00:43:56,849

And you can actually see it in the sky at night, which is really fun.

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00:43:56,849 --> 00:44:02,859

So, next, I'm going to invite any members of our studio audience here to join us and

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00:44:02,859 --> 00:44:09,759

have your questions answered by our panelists, whether it's a question about careers or education

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or just anything that you might be curious about, about NASA. And we have a microphone

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over here if anybody wants to ask a question. You can take your time.

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00:44:21,890 --> 00:44:28,789

Unidentified Woman: For the upcoming mission in Mars, what kind of changes and improvements

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00:44:28,789 --> 00:44:35,789

to the space shuttle do you have to make? That's a great question.

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00:44:36,459 --> 00:44:37,099

That is a great question. Yeah. Who wants to take it?

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00:44:37,099 --> 00:44:38,829

I'll start. I'll start. But, I assume that we'll add to it because I certainly don't

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00:44:38,829 --> 00:44:43,479

know everything that has to change. But, the first thing to note is the space shuttle that

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00:44:43,479 --> 00:44:47,979

we remember, the space shuttle from the 1980s and '90s, the one that you're probably picturing,

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00:44:47,979 --> 00:44:53,319

could never leave what we call low Earth orbit. So, it could only go and orbit the Earth up

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00:44:53,319 --> 00:44:58,309

to so many miles in what we call in the field low Earth orbit. So, the first change that

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00:44:58,309 --> 00:45:02,489

would have to happen is to go back to the early rocket days, like the Apollo rocket,

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00:45:02,489 --> 00:45:06,279

if you remember the one that went to the moon. And you would have to--it doesn't have to

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00:45:06,279 --> 00:45:09,999

necessarily look more like that. But, the new one does look a little bit more like that.

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00:45:09,999 --> 00:45:13,839

And the main thing it has to be able to do is leave Earth's orbit. And that's called

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00:45:13,839 --> 00:45:17,400

the escape velocity. So, it has to be able to go fast enough that

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00:45:17,400 --> 00:45:22,609

it can actually leave the gravitational pull of Earth, which is how anything stays in orbit,

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00:45:22,609 --> 00:45:25,859

is the gravity keeps them there. So, that's the first major change that I can

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00:45:25,859 --> 00:45:28,690

think of. That's a good answer.

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00:45:28,690 --> 00:45:30,900

And propulsion, right? Absolutely.

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00:45:30,900 --> 00:45:36,579

So, we are looking at different types of propulsion to help our vehicles get farther and deeper

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00:45:36,579 --> 00:45:41,200

into space. So, propulsion's another component of that.

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00:45:41,200 --> 00:45:43,739

And it'll help us get there faster.
It'll help us get there faster.

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00:45:43,739 --> 00:45:45,109

Yeah.
And protecting the humans.

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00:45:45,109 --> 00:45:48,459

So, the further out we go, we're not protected

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00:45:48,459 --> 00:45:53,420

from the radiation that's felt in the environment.
So, we have to design the vehicle to protect

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00:45:53,420 --> 00:45:58,640

the humans against the radiation. We have
to have a way to get our own food, grow our

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00:45:58,640 --> 00:46:04,739

own food, or somehow make our own food, replenish
our water supply systems.

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00:46:04,739 --> 00:46:10,269

And make sure, again, if you're going out
there for six to nine months, you're unloaded.

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00:46:10,269 --> 00:46:14,660

Your body is floating on the way to Mars for
that long. So, how will the body react once

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00:46:14,660 --> 00:46:18,719

it lands again on a terrestrial environment
that has some kind of gravity vector?

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00:46:18,719 --> 00:46:22,380

So, how do we keep the body healthy? Do we keep the exercising going? Those are things

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00:46:22,380 --> 00:46:27,690

we're working on Space Station right now to try to understand. So, from the mechanical

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00:46:27,690 --> 00:46:32,089

to the life, it's a full range of work that needs to be done that vehicle.

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00:46:32,089 --> 00:46:37,700

And we're already starting what you're thinking of, the space shuttle that we're used to,

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00:46:37,700 --> 00:46:42,089

that's in our generation, was the shuttle transportation system. And we've retired those

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00:46:42,089 --> 00:46:47,190

vehicles.

They are either--Kennedy has Atlantis. The

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00:46:47,190 --> 00:46:54,190

museum here has Discovery. So, they're in various museums. The new launch vehicle, SLS,

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00:46:55,109 --> 00:47:00,069

or the Space Launch System, is we're currently working on the next generation vehicle that

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00:47:00,069 --> 00:47:05,229

will help us get beyond the moon and further into space and Mars.

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00:47:05,229 --> 00:47:11,119

So, we're actually--our engineers, our propulsion engineers, our rocket scientists, they're

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00:47:11,119 --> 00:47:17,249

actually working today and tomorrow and the next several years to actually build that

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00:47:17,249 --> 00:47:23,869

SLS rocket and the crew capsule, which is known as Orion.

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00:47:23,869 --> 00:47:30,869

Thank you. That's a great question. Yeah.
Unidentified Woman: Do you think the classes

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00:47:33,390 --> 00:47:40,390

that you took in middle and high school affected your position today?

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00:47:40,430 --> 00:47:45,420

Absolutely.
It's very, very important to, I think, that

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00:47:45,420 --> 00:47:49,719

as a middle school student and a high school student, that you should embrace all your

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00:47:49,719 --> 00:47:56,349

classes, English, humanities, math, science, so that you could become a well-rounded scientist,

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00:47:56,349 --> 00:48:01,049

engineer, mathematician.
You don't just want to limit your coursework

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00:48:01,049 --> 00:48:08,049

to a math path or a science path. You want to take all your liberal arts and STEM type

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00:48:10,079 --> 00:48:14,969

course so that you could become very well-rounded and you could become more informed as you

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00:48:14,969 --> 00:48:21,969

move into your higher grades and into college.

So, I like the fact that I've enjoy [sic]

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00:48:22,489 --> 00:48:28,410

Machiavelli just as much as I enjoy my chemistry textbooks. So, it's important to embrace all

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00:48:28,410 --> 00:48:35,410

of those courses and literature and English.

And even, you know, we talked earlier about,

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00:48:36,390 --> 00:48:39,900

you know, home economics or family consumer science or--.

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00:48:39,900 --> 00:48:42,719

--Oh, yeah--.

--And shop classes. So, embrace all of the

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00:48:42,719 --> 00:48:49,549

coursework and do well. So, study hard, read a lot, but enjoy what you're doing as well.

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00:48:49,549 --> 00:48:54,670

And I'll tell you what--so, in school, I think

what I used the most, and I will be very honest.

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00:48:54,670 --> 00:49:00,089

I don't mix chemicals. I don't do what chemistry has taught me every single day.

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00:49:00,089 --> 00:49:01,979

Right.

And I certainly don't pull out a formula for

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00:49:01,979 --> 00:49:06,709

math every single day. I don't do algebra.

I don't look for X. But, what all of that

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00:49:06,709 --> 00:49:10,699

taught me, and I only know it now. I didn't know it at your age, any of your ages.

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00:49:10,699 --> 00:49:13,539

Right.

But, I do know it now. It taught me to think.

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00:49:13,539 --> 00:49:19,599

It taught me how to analyze a problem. How do I take the given the information and come

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00:49:19,599 --> 00:49:21,410

up with an answer from it.

Yeah. Right.

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00:49:21,410 --> 00:49:26,549

So, that thought process, to go from given to answer, was what I learned in school. And

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00:49:26,549 --> 00:49:30,499

that is probably the most important thing I got from school that I use every single

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00:49:30,499 --> 00:49:31,289

day.

So true.

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00:49:31,289 --> 00:49:37,069

And I didn't know it till I got to a philosophy at the university. And the philosophy teacher

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00:49:37,069 --> 00:49:42,140

said, you know what university means? Universe, the one truth. You're here to learn the one

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00:49:42,140 --> 00:49:45,979

truth. But, to get to that one truth, you have to learn every other part of the world

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00:49:45,979 --> 00:49:48,709

around you.

So, even if you're not really interested in

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00:49:48,709 --> 00:49:53,459

physics, guess what? You're part of physics every day. And like Mamta said, it's a matter

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00:49:53,459 --> 00:49:57,749

of what you're learning that makes you a whole. All these little pieces make you a whole.

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00:49:57,749 --> 00:50:01,469

And they're all representative of the real world that we live in and that you're interactive

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00:50:01,469 --> 00:50:04,229

in every day.

So, right now, you know, physics may not be

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00:50:04,229 --> 00:50:09,390

so fun. But, you might get to your next level physics and think it's amazing. You know,

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00:50:09,390 --> 00:50:11,130

it also depends on the type of teacher you have, too.

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00:50:11,130 --> 00:50:18,130

Yeah. Definitely. Do we have any other questions from our studio audience? We've got time for

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00:50:18,459 --> 00:50:23,479

one or two more.

Unidentified Woman: Can moms come up?

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00:50:23,479 --> 00:50:27,109

Moms can definitely ask questions.

Yes.

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00:50:27,109 --> 00:50:33,489

Unidentified Woman: I heard you all say that your mothers, and I'm so proud that--I'm so

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00:50:33,489 --> 00:50:38,809

proud of that because I think one of the main issues is a lot of women who are asking themselves

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00:50:38,809 --> 00:50:43,369

in their mind can I have a family and be in science or in STEM?

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00:50:43,369 --> 00:50:48,660

So, what advice would you give to a woman facing that question right now?

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00:50:48,660 --> 00:50:55,660

Work/life balance. You have to really understand work/life balance. Come to work. Do a great

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00:50:56,009 --> 00:51:02,199

job. Understand when you go home you have responsibilities at home. But, also take care

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00:51:02,199 --> 00:51:07,579

of yourself. I mean go get the massage. Go to yoga class. Do what you need to do for

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00:51:07,579 --> 00:51:14,579

yourself because we're all intrinsically motivated to do a great job at everything we do, not

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00:51:14,819 --> 00:51:20,289

just at work, but at home.

And so, we--I know I have to be cognizant

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00:51:20,289 --> 00:51:26,579

of my work/life balance. I don't always do a good job. But, I try. It's a living thing.

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00:51:26,579 --> 00:51:33,579

It's a daily checks and balances. But, I think that--and also a support system. I not only--my

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00:51:35,420 --> 00:51:39,599

husband is a great support. But, I also have community support in my neighbors that are

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00:51:39,599 --> 00:51:43,239

also very supportive.

And you have to not be afraid to reach out

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00:51:43,239 --> 00:51:50,239

for that support. And NASA's a great place for women with families, men with families,

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00:51:50,880 --> 00:51:57,880

families with families. It's a really great place to--it's very family friendly, in my

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00:51:57,890 --> 00:52:03,589

experiences here at NASA. Yeah.

So, it's everything she just said. And it

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00:52:03,589 --> 00:52:08,390

brings to mind one particular point in my career, another one of these defining moments

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00:52:08,390 --> 00:52:13,469

where I was working at NASA for about eight years before I had my daughter.

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00:52:13,469 --> 00:52:18,369

And I went on maternity leave and came back.

And a lot had changed. And things were slower

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00:52:18,369 --> 00:52:22,680

for me. And before I had her, I was like full-bore into it. I was there, you know, all day, every

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00:52:22,680 --> 00:52:25,930

day. That was my life. That was my life.
I came back. And it was kind of like everything

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00:52:25,930 --> 00:52:30,699

had changed. Now what? And I remember one
of my male coworkers came and stopped by my

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00:52:30,699 --> 00:52:34,239

office. He's like, how's it going. And I'm
like, I don't know, man. It's just a little

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00:52:34,239 --> 00:52:38,440

boring. And it's just not as challenging to
me.

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00:52:38,440 --> 00:52:44,849

And he goes you know what? You're a new mom.
Why don't you just take that time to--take

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00:52:44,849 --> 00:52:49,479

this time to enjoy your daughter. Enjoy life
with her. Work will pick up. You'll get back

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00:52:49,479 --> 00:52:51,989

into your career.
And you know what? Any other woman could have

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00:52:51,989 --> 00:52:55,589

taken that, you know, you--if you're really
sensitive, you could've taken that as offensive.

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00:52:55,589 --> 00:53:00,499

Like, what do you mean telling me I should
focus on my daughter and not come back to

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00:53:00,499 --> 00:53:04,209

working so hard?
But, if you're introspective and you really

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00:53:04,209 --> 00:53:08,799

consider what people tell you, you think about it. And so, I thought about it. And I weighed

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00:53:08,799 --> 00:53:14,690

on it. And he was right. I followed that advice. I just threw myself into the motherhood.

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00:53:14,690 --> 00:53:18,910

And the career just picked right back up. Things fall back in line because why? You're

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00:53:18,910 --> 00:53:22,809

happy with what you're doing. You go with the flow. Go with what you're happy with doing.

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00:53:22,809 --> 00:53:26,400

And I was really enjoying my daughter. I'm still enjoying her eight years later.

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00:53:26,400 --> 00:53:30,359

And being in the STEM workforce now, I get to take her along on a lot of the things that

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00:53:30,359 --> 00:53:34,219

I get to do. She gets to tour the labs. She gets to meet other researchers. These are

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00:53:34,219 --> 00:53:37,499

all things I didn't have when I was growing up, none of this access.

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00:53:37,499 --> 00:53:43,150

So, being a mom to an eight-year-old in this world is amazing. And I know Mamtra's got

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00:53:43,150 --> 00:53:43,949

a one-and-a-half-year-old?
Yeah.

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00:53:43,949 --> 00:53:48,499

He's 15 months. He's brand-new. At least I feel like he's brand-new. I like to keep him

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00:53:48,499 --> 00:53:50,279

brand-new as long as possible. I have a four-year-old.

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00:53:50,279 --> 00:53:51,469

Oh, gosh. Oh, how exciting. Four?

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00:53:51,469 --> 00:53:53,880

A four-year-old. Wow, one-and-a-half--.

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00:53:53,880 --> 00:53:58,249

--When did mine get so old? The one piece of advice I would give to a

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00:53:58,249 --> 00:54:05,049

mom is don't be afraid to ask. And if--and you know--and we are fortunate that we have

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00:54:05,049 --> 00:54:09,569

a wonderful place here at NASA that is family friendly. But, not all women are. Not all

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00:54:09,569 --> 00:54:13,279

men are either. And we know that the jobs vary greatly in

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00:54:13,279 --> 00:54:19,259

the US from companies that don't give any type of flexibility to parents, both moms

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00:54:19,259 --> 00:54:25,199

and dads, to places like the government, where you have this liberty to have a work/life

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00:54:25,199 --> 00:54:27,910

balance.

So, what I would say, if at all possible,

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00:54:27,910 --> 00:54:31,809

ask. Don't be afraid to ask because even in this wonderful life of work/life balance,

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00:54:31,809 --> 00:54:37,809

I still become afraid to ask if I can take time off and make up the hours later to go

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00:54:37,809 --> 00:54:42,019

do this with my son.

I still am afraid. And I shouldn't be because

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00:54:42,019 --> 00:54:46,930

every time I have asked, sure. Absolutely.

And if you need, just work from home, and

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00:54:46,930 --> 00:54:50,339

then come back. And why don't we do this event here. And we'll move this meeting.

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00:54:50,339 --> 00:54:55,660

Every time I've asked, somebody has helped me figure out a way to achieve my goals, exceed

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00:54:55,660 --> 00:55:00,519

my expectations, and spend time with my son.

How awesome is that?

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00:55:00,519 --> 00:55:04,489

So, if anyone who's watching this is out in the private world, I would say don't be afraid

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00:55:04,489 --> 00:55:08,749

to ask. And if it's at all possible, keep asking till you find the right supervisor

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00:55:08,749 --> 00:55:14,029

and the right mentor who will afford you these liberties if it's at all possible because,

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00:55:14,029 --> 00:55:17,839

honestly, I had a really hard time.

And I still have a really hard time coming

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00:55:17,839 --> 00:55:21,099

to work and leaving him. And even just this morning, he's waving to me. And, you know,

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00:55:21,099 --> 00:55:26,839

and he's excited. And I'm the one inside who's just--I can't believe I'm having to leave

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00:55:26,839 --> 00:55:29,189

him.

But, then I come to work. And I have these

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00:55:29,189 --> 00:55:33,890

wonderful people around me. And I have this awesome supervisor, who on my very first day

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00:55:33,890 --> 00:55:39,189

of work, I thought for sure she was going to lay out expectations that I wasn't going

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00:55:39,189 --> 00:55:41,109

to be able to meet. And that was my greatest fear.

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00:55:41,109 --> 00:55:45,549

And she said--she goes, okay, so, what hours are you going to work? And I immediately felt

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00:55:45,549 --> 00:55:49,209

this pressure to say I'm going to get in at six. And I'll stay until four, you know? And

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00:55:49,209 --> 00:55:51,479

I felt this pressure.

And so, that's what I said. She looked at

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00:55:51,479 --> 00:55:56,769

me. She goes why don't you just test out [unintelligible] and see what it's like for the next couple

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00:55:56,999 --> 00:56:00,539

Come back to me and let me know what hours you're going to work. And we'll just go from

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00:56:00,539 --> 00:56:04,449

there. I came back. And I told her my hours. And I said, you know, how--my plan, the plan

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00:56:04,449 --> 00:56:08,219

that I thought would work for my family. And she said go home and talk to your husband

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00:56:08,219 --> 00:56:11,459

and just, you know, why don't just talk about this and think about it? I came back with

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00:56:11,459 --> 00:56:13,229

my hours. She said okay. That works. That's awesome.

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00:56:13,229 --> 00:56:15,420

You're doing great. Yeah. That's good.

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00:56:15,420 --> 00:56:17,670

Yeah. So, find that support system if you can find

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00:56:17,670 --> 00:56:21,269

it. And if you can't find it where you're at, and if it's at all possible, try finding

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00:56:21,269 --> 00:56:22,039

it elsewhere.

That's true.

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00:56:22,039 --> 00:56:26,410

And to add to that, basically, guys, this is one thing you should remember too. Never

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00:56:26,410 --> 00:56:30,939

be afraid to ask. If you have a plan, even if it's outside of the normal routine, that's

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00:56:30,939 --> 00:56:35,749

how I got here a lot of--just ask. Create something yourself. Put it out there, and

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00:56:35,749 --> 00:56:38,779

ask.

The worst they can say is no, right? You just--sometimes

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00:56:38,779 --> 00:56:42,609

you don't start new programs or new pathways for anybody else if you aren't the first one

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00:56:42,609 --> 00:56:45,509

to ask. So, what if they say no? You just ask again later.

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00:56:45,509 --> 00:56:46,809

Ask again, right?

Or bring up a new plan.

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00:56:46,809 --> 00:56:49,319

Timing is everything, right?

Timing is everything.

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00:56:49,319 --> 00:56:54,519

Timing is everything. I've never applied for a detail assignment. I have always created

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00:56:54,519 --> 00:56:56,449

a detail assignment.

Yeah. Right.

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00:56:56,449 --> 00:56:58,839

Right? Yep.

But, being a mom should never be a limiting

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00:56:58,839 --> 00:57:03,910

factor. It shouldn't be.

Unidentified Woman: Thank you for your answer.

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00:57:03,910 --> 00:57:06,069

And thank you for being such great role models.

Thank you.

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00:57:06,069 --> 00:57:08,989

: Aw, thank you.

Thanks for your question. Do we have one final

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00:57:08,989 --> 00:57:15,989

question in the audience?

Unidentified Woman: In your NASA or STEM career,

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00:57:20,229 --> 00:57:26,979

have you ever actually needed to use algebra?

I use algebra to balance my checkbook. I'm

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00:57:26,979 --> 00:57:33,979

not even kidding. Like, if I spent this much

and needed that much, then, you know, X is

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00:57:34,900 --> 00:57:37,779

this much. Y is that much. Well, that's about

it.

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00:57:37,779 --> 00:57:42,900

Yeah.

Well, no, I think I have used it, not in like--so,

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00:57:42,900 --> 00:57:47,099

the--okay. So, in algebra, there's two different kinds of things. There's the word problems.

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00:57:47,099 --> 00:57:51,380

Are you in algebra right now? No? Okay. So, when you get to algebra, there'll be two different

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00:57:51,380 --> 00:57:54,519

sections, right?

There's the word problems. Those, yes, absolutely,

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00:57:54,519 --> 00:57:55,959

I'd say we've all used those.

Yeah.

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00:57:55,959 --> 00:57:57,829

You get this given information. You've got

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00:57:57,829 --> 00:58:00,390

to--that's what I talked about earlier. You've got to find the answer.

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00:58:00,390 --> 00:58:01,999

Get the X. Yeah.

Absolutely use those.

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00:58:01,999 --> 00:58:06,689

When you're talking about your typical like X plus $3X$ plus $4Y$ equals something, and you

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00:58:06,689 --> 00:58:12,390

have to solve for X and Y , you do in the technical world. You do when you are designing a mission.

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00:58:12,390 --> 00:58:17,619

Like, you asked earlier about how to make changes to a vehicle that will actually go

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00:58:17,619 --> 00:58:23,089

beyond low Earth orbit and further into space.
You do actually have to use algebra in those

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00:58:23,089 --> 00:58:26,779

types of things. And a lot of it's also formulas
that you have use.

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00:58:26,779 --> 00:58:27,400

Right.

Yeah.

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00:58:27,400 --> 00:58:29,119

To create chemical compounds and things like
that in labs.

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00:58:29,119 --> 00:58:31,329

You use that a lot in chemistry. Yeah.

Yeah.

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00:58:31,329 --> 00:58:35,529

But, the word problems are algebraic. It's
part of your everyday life too. I mean you're

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00:58:35,529 --> 00:58:36,799

always doing algebra. You just don't know
it.

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00:58:36,799 --> 00:58:37,729

You just don't know it. Yeah.

Exactly. Yeah.

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00:58:37,729 --> 00:58:39,779

When you're solving a problem.

And it's hard--yeah.

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00:58:39,779 --> 00:58:44,829

Always. Always.

And I'd say I figured all of this out when

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00:58:44,829 --> 00:58:47,059

I turned about 30 years old.
I know. It's such a shame. It's such a shame.

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00:58:47,059 --> 00:58:51,410

We can sit up here and tell you all day long
what you're going to know. But, yeah.

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00:58:51,410 --> 00:58:53,140

Someday you'll know.
Yeah.

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00:58:53,140 --> 00:58:57,039

Thank you.
Thanks for your question. All right, everyone.

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00:58:57,039 --> 00:59:01,519

Well, thank you very much for your questions
and for this excellent rich discussion about

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00:59:01,519 --> 00:59:07,459

careers at NASA for women and for everyone.
I encourage you all to stay with us. Follow

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00:59:07,459 --> 00:59:10,890

what we're up to. And get involved.
We have lots of opportunities for citizen

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00:59:10,890 --> 00:59:15,319

scientists and people who are interested in
technology challenges to get involved with